UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/402,482	11/09/1999	CHRISTOPH GROHMANN	P18477	6003

7590 05/08/2003

GREENBLUM & BERNSTEIN
1941 ROLAND CLARKE PLACE
RESTON, VA 20191

EXAMINER
KIBLER, VIRGINIA M

ART UNIT	PAPER NUMBER
2623	12

DATE MAILED: 05/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/402,482	Applicant(s) GROHMANN ET AL.	
	Examiner Virginia M Kibler	Art Unit 2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *14-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *14-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 14-24 and 27-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adams et al. (5,561,696) in view of Niklason et al. (5,872,828) in further view of Annis (6,347,132).

Regarding claim 14, Adams et al. ("Adams") discloses an apparatus or "device" for inspecting a test object (Abstract, lines 1 and 5) with moveably arranged X-ray beam tube (Figure 1, element 20) and detector 30 and a stationary object 10. The X-ray beam tube and the detector both have a small field of view in relation to a horizontal extent of an area of the test object to be inspected as shown in Figure 3a. The X-ray beam 282 illuminates a region 283 of the circuit board 210 (Col. 15, lines 64-66). Adams does not disclose linearly moving the X-ray beam tube and detector. However, Niklason et al. ("Niklason") teaches that it is known to move an X-ray beam tube and detector linearly within parallel X-Y planes (Figure 1). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the movement of the X-ray beam tube and the detector disclosed by Adams to linearly move them, as taught by Niklason, in order to simplify reconstruction of the image (Col. 1, lines 50-59 and Col. 5, lines 16-21). Adams and Niklason do not recognize the test object being fixed throughout the entire inspection, rather Adams discloses moving the test object in order to

inspect the entire area. However, Annis teaches that it is known to move the test object or the X-ray beam tube and detector in order to inspect the entire area (Col. 2, lines 48-61). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the inspection of the test object, disclosed by Adams and Niklason, to keep the test object stationary while moving the X-ray beam and detector to inspect the entire area, as taught by Annis, as a design parameter.

Regarding claim 15, Adams discloses a carrier adapted to be fixedly mounted during inspection. The test object is mounted to a fixture 220 or "carrier" which is attached to a positioning table 230 capable of moving the fixture and test object (Col. 15, lines 18-21). The arguments analogous to those presented above for claim 14 are applicable to claim 15.

Regarding claim 16, Adams discloses a master computer 270 or a "computing device" being coupled to the detector as shown in Figure 3a.

Regarding claim 17, Adams discloses a high speed image analysis computer 272 or an "analysis unit" being connected to the computing device 270 as shown in Figure 3a.

Regarding claim 18, Adams discloses an X-ray beam tube comprising a microfocus tube with a focal spot approximately 20-microns in diameter (Col. 17, lines 4-5).

Regarding claim 19, Adams discloses a detector comprising a CCTV camera (Col. 19, lines 15-16) inherently will have a CCD chip arranged on a taper.

Regarding claim 20, Adams discloses an X-ray beam tube and detector adapted for two-dimensional inspection of the test object (Col. 11, lines 3-4).

Regarding claim 21, Adams discloses an X-ray beam tube and detector adapted for three-dimensional inspection of the test object (Figure 2a).

Regarding claim 22, Adams discloses a device wherein the test object comprises a printed circuit board 210 as shown in Figure 3a (Col. 14, lines 62-63).

Regarding claim 23, Adams discloses a device adapted for X-ray inspection of soldered joints 214 on printed circuit boards 210 as shown in Figure 3a and 3b (Col. 15, lines 6-8).

Regarding claim 24, Adams discloses the device adapted for fully automated 100% X-ray inspection of soldered joints 214 on PCB 210 (Figure 3a).

Regarding claim 27, Niklason discloses the X-ray beam tube and detector adapted to move parallel to each other (Figure 1).

Regarding claim 28, Annis discloses the X-ray beam tube and detector adapted to move together in a same direction as shown in Figure 1 (Col. 2, lines 48-61).

Regarding claim 29, Annis discloses the X-ray beam tube and detector adapted to move in a same direction as shown in Figure 1 (Col. 2, lines 48-61).

Regarding claim 30, Niklason discloses the X-ray beam tube and detector adapted to move in opposite directions (Figure 1).

Regarding claim 31, Niklason discloses the X-ray beam tube and detector adapted to move parallel to the test object (Figure 1).

Regarding claim 32, Adams discloses a method or "process" for inspecting a test object (Abstract, lines 1 and 5). The arguments analogous to those presented above for claim 14 are applicable to claim 32. Note that the test object is fixedly mounted by fixture 220 in Figure 3a.

Regarding claim 33, the arguments analogous to those presented above for claim 27 are applicable to claim 33.

Regarding claim 34, the arguments analogous to those presented above for claim 28 are applicable to claim 34.

Regarding claim 35, the arguments analogous to those presented above for claim 29 are applicable to claim 35.

Regarding claim 36, the arguments analogous to those presented above for claim 30 are applicable to claim 36.

Regarding claim 37, the arguments analogous to those presented above for claim 31 are applicable to claim 37.

3. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adams et al. (5,561,696) in view of Niklason et al. (5,872,828) in further view of Annis (6,347,132) as applied to claim 14 above, and further in view of Armistead (4,852,131).

Regarding claim 25, Adams et al. ("Adams") discloses an analysis unit including a learning mode in which a set of testing algorithms is transmitted to the analysis unit (Figure 48, element 4040). Adams discloses using algorithms to generate a dynamic block of learned-joint data to store information for each individual soldered joint rather than a characteristic vector (Col. 59, lines 8-10). The dynamic block of data is optimized by updating the dynamic block of data during learning (Col. 59, lines 15-19) based on the analysis of multiple boards (Col. 59, lines 12-13). However, Armistead teaches that it is known to use learned characteristic vectors. Armistead's learning mode includes component and bond defect vectors or "learned characteristic vectors" (Col. 6, lines 43-46). The characteristic vector is updated or "optimized" in step 6F of Figure 11. The learning mode provides a normalized model image or a "defect-free" representation (Col. 8, lines 36-45). It would have been obvious to one of ordinary skill in

the art at the time of the invention to have modified the learning mode disclosed by Adams to include a characteristic vector and a defect-free representation, as taught by Armistead, in order to provide a model of each soldered joint for inspection.

4. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Adams et al. (5,561,696) in view of Niklason et al. (5,872,828), Annis (6,347,132), and Armistead (4,852,131) as applied to claim 25 above, and further in view of Rooks (5,719,952).

Regarding claim 26, the arguments analogous to those presented above for claim 25 are applicable to claim 26. The testing mode disclosed by Adams et al. ("Adams") does not recognize the need for a pad image buffer, learned characteristic vectors with tolerances, nor a correlation between the learned characteristic vectors and the soldered joint under inspection. However, Armistead teaches that it is known to include learned characteristic vectors with tolerances in an inspection (Figure 9, S2) or "testing" mode. Armistead's testing mode includes component and bond defect vectors or "learned characteristic vectors" (Col. 6, lines 43-46) with tolerances (Col. 6, lines 32-36). To test a soldered joint, the image data comparing computer 61 is used to determine a correlation between the learned characteristic vectors and the soldered joint under test (Col. 8, lines 46-50). Armistead does not recognize the need for a pad image buffer. However, Rooks teaches that it is known to use a frame or "pad image" buffer (Col. 4, line 46). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the analysis unit disclosed by Adams to include learned characteristic vectors and a correlation between the learned characteristic vectors and the soldered joint under inspection, as taught by Armistead, and a pad image buffer, as taught by Rooks, in order to further analyze the solder joint under inspection.

Contact Information

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Virginia M Kibler whose telephone number is (703) 306-4072. The examiner can normally be reached on Mon.-Thurs. 8:00 - 5:30 and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

VK
May 3, 2003